## CLAIMS

What is claimed is:

1. A Media Access Control (MAC) hardware device for supporting MAC Operations, Administration, Maintenance, and Provisioning (OAMP) functionality, comprising:

a MAC OAMP Control sublayer for processing OAMP frames and maintaining OAMP state; and

a plurality of MAC sublayers for carrying out MAC operations.

2. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer additionally performs at least one of creating, modifying, and monitoring OAMP frames.

3. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer provides an architecture for OAMP functionality in the form of at least one of administration, configuration management, performance evaluation, technical support, and billing.

4. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer supports OAMP functionality in the form of at least one of Alarms, Remote Defects, Automatic Protection Switching, Loopbacks, Performance Monitoring, Trace Signals, Sync Signals, Bit Error Rate Tests, Data Communication Channel, Orderwire, Service Level Agreements, and OAMP operations.

5. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer supports end to end OAMP information for at least of a Wave layer, a Physical layer, a Section layer, a Line layer, and a Path layer.

6. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer is based on Network Equipment (NE) functionality in an Ethernet Network and is configured to terminate OAMP information for at least one of a Wave layer, a Physical layer, a Section layer, a Line layer, and a Path layer.

7. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer processes OAMP information for a layer terminated by the MAC OAMP Control sublayer and all layers below the terminated layer.

8. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer monitors OAMP information for an unterminated layer.

9. The MAC hardware device of claim 1, the plurality of MAC sublayers further comprises at least one MAC Control sublayer for generating control frames.

10. The MAC hardware device of claim 1, wherein a MAC Control Layer processes optional VLAN tags in control frames.

11. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer is implemented in the MAC hardware device.

12. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer supports OAMP for a Wave Layer.

13. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer supports OAMP for a Physical Layer.

14. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer supports OAMP for a Section Layer.

15. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer supports OAMP for a Line Layer.

16. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer supports OAMP for a Path Layer.

17. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer supports OAMP for logical links/line formed by a Link Aggregation sublayer.

18. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer supports OAMP for physical links/line.

19. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer supports OAMP for end to end Network Layer paths.

20. The MAC hardware device of claim 1, wherein the plurality of MAC sublayers is implemented in at least one of an Ethernet Switch device and an Ethernet MAC device.

21. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer processes an Ethernet MAC OAMP control frame.

22. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer maintains an Ethernet MAC OAMP control state.

23. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer generates an interrupt when an OAMP frame is detected to invoke a MAC OAMP Client.

24. The MAC hardware device of claim 1, wherein the MAC OAMP Control Layer generates an interrupt when an OAMP state change is detected to invoke a MAC OAMP Client.

25. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer communicates with an Ethernet MAC OAMP Client.

26. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer responds to an Ethernet MAC OAMP control frame.

27. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer communicates with an Ethernet PHY.

28. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer operates as a pass through for a received Ethernet MAC OAMP control frame.

29. The MAC hardware device of claim 1, wherein the MAC OAMP Control sublayer retransmits after modifying a received Ethernet MAC OAMP control frame.

30. An Ethernet physical layer (PHY) hardware device, comprising:

a decoder; and

at least one physical sublayer;

wherein the at least one physical sublayer generates an interrupt when a port/link failure is detected to invoke a MAC OAMP Client.

31. An Ethernet physical layer (PHY) hardware device, comprising:

a decoder; and

at least one physical sublayer;

wherein the at least one physical sublayer generates a signal when a port/link failure is detected to signal a MAC OAMP Control Sublayer.

32. A method of providing OAMP functionality on a MAC hardware device and a PHY hardware device, comprising:

detecting a failure along a first link on a near end network node;

a Physical Layer generating an interrupt when a port/link failure is detected to invoke a MAC OAMP Client; and

switching to a second link to correct the failure.

33. The method of claim 32, wherein the method executes within about 50 ms to provide recovery functionality on an Ethernet protocol network.

34. A method of providing OAMP functionality on a MAC hardware device and a PHY hardware device, comprising:

detecting a failure along a first link on a near end network node;

a Physical Layer generating a signal when a port/link failure is detected to invoke a MAC OAMP Control Sublayer; and

switching to a second link to correct the failure.

35. The method of claim 34, wherein the method executes within about 50 ms to provide recovery functionality on an Ethernet protocol network.

36. A method of providing OAMP functionality on a MAC hardware device and a PHY hardware device, comprising:

detecting a OAMP Control Frame on a near end network node;

a MAC Control Sublayer generating an interrupt when a OAMP Control Frame with switchover criteria is detected to invoke a MAC OAMP Client; and

switching to a second link to correct the failure.

37. The method of claim 36, wherein the switchover criteria comprises at least one of Signal Failure hard failures, Signal Defect soft failures, APS switchover requests, alarm events, and Excessive Path BER.

38. The method of claim 36, wherein the method executes within about 50 ms to provide recovery functionality on an Ethernet protocol network.

39. A method of providing OAMP functionality on a MAC hardware device and a PHY hardware device, comprising:

detecting a OAMP Control Frame on a near end network node;

a MAC Control Sublayer generating an interrupt when a OAMP Control Frame with switchover criteria is detected to signal a MAC OAMP Control Sublayer; and

switching to a second link to correct the failure.

40. The method of claim 39, wherein the switchover criteria comprises at least one of link/line hard Signal Failure hard failures, Signal Defect soft failures, APS switchover requests, alarm events, and Excessive Path BER.

41. The method of claim 38, wherein the method executes within about 50 ms to provide recovery functionality on an Ethernet protocol network.

42. A method of providing OAMP functionality on a MAC hardware device, comprising:

a near end MAC OAMP Control sublayer receiving a MAC OAMP Control Frame containing OAMP information from a MAC OAMP Control Frame buffer;

the near end MAC OAMP Control sublayer updating MAC OAMP state hardware registers to reflect receipt of the OAMP information;

the MAC hardware providing maskable interrupts for MAC OAMP Control Frames received;

the near end MAC OAMP Control sublayer generating interrupts to invoke an OAMP Client;

the OAMP Client processing the OAMP information; and

the OAMP Client taking an OAMP action based on the OAMP information.

43. The method of claim 42, wherein the OAMP information comprises at least one of an alarm indicator status, remote defect indicator, Automatic Protection Switching requests, loopback requests, performance monitoring parameters, switchover requests, service level agreements, and OAMP operations information.

44. The method of claim 42, further comprising, upon receipt of an alarm event, an Alarm Indicator Signal (AIS) of a corresponding layer propagating to a downstream Network Equipment.

45. The method of claim 42, further comprising, upon receipt of an alarm event, a Remote Defect Indicator (RDI) of a corresponding layer propagating to an upstream Network Equipment.

46. The method of claim 42, wherein the method executes within about 50 ms to provide recovery functionality.

47. The method of claim 42, further comprising retransmitting the MAC OAMP Control Frames received to provide pass through functionality.

48. The method of claim 42, further comprising retransmitting the MAC OAMP Control Frames received after modifying the received frame.

49. A method of providing OAMP functionality on a MAC hardware device, comprising:

a near end MAC OAMP Control sublayer receiving a MAC OAMP Control Frame containing an OAMP information from a MAC OAMP Control Frame buffer;

the near end MAC OAMP Control sublayer updating MAC OAMP state hardware registers to reflect receipt of the OAMP information;

the MAC OAMP state hardware registers providing maskable interrupts for MAC OAMP Control Frames received;

the near end MAC OAMP Control sublayer processing the OAMP information; and

the MAC OAMP Control sublayer taking an OAMP action based on the OAMP information.

50. The method of claim 49, wherein the OAMP information comprises at least one of an alarm indicator status, remote defect indicator, Automatic Protection Switching requests, loopback requests, performance monitoring parameters, switchover requests, service level agreements, and OAMP operations information.

51. The method of claim 49, further comprising, upon receipt of an alarm event, an Alarm Indicator Signal (AIS) of a corresponding layer propagating to a downstream Network Equipment.

52. The method of claim 49, further comprising, upon receipt of an alarm event, a Remote Defect Indicator (RDI) of a corresponding layer propagating to an upstream Network Equipment.

53. The method of claim 49, wherein the method executes within about 50 ms to provide recovery functionality.

54. The method of claim 49, further comprising retransmitting the MAC OAMP Control Frames received to provide pass through functionality.

55. The method of claim 49, further comprising retransmitting the MAC OAMP Control Frames received after modifying the MAC OAMP Control Frames received.

56. A method of providing OAMP functionality on a MAC hardware device, comprising:

a near end MAC OAMP Control sublayer receiving OAMP Client requests to be transmitted;

the near end MAC OAMP Control sublayer creating an OAMP Control frame with requested control parameters; and

the near end MAC OAMP Control sublayer transmitting the OAMP Control frame.

57. The method of claim 56, wherein the OAMP control parameters comprise at least one of an alarm indicator status, remote defect indicator, Automatic Protection Switching requests, loopback requests, performance monitoring parameters, switchover requests, or various other OAMP operations information.

58. The method of claim 56, wherein the method executes within about 50 ms to provide recovery functionality.

59. In a MAC OAMP hardware device, an Ethernet MAC OAMP Control Frame for supporting SDH/SONET OAMP Signaling Protocol, comprising:

a standard Ethernet frame Preamble field;

a standard Ethernet Start-of-Frame Delimiter field;

a standard Ethernet Destination MAC address field;

a standard Ethernet Source MAC address field;

an optional standard Ethernet VLAN Tag field;

a standard Ethernet Type field;

a standard Ethernet MAC Control Opcode field;

a plurality of standard Ethernet MAC Control Parameters being opcode specific; and

a standard Ethernet Frame Check Sequence field.

60. The Ethernet MAC OAMP Control Frame of claim 59, wherein the Ethernet MAC Control Opcode further comprises an ability to distinguish between a wave frame, a physical frame, a section frame, a logical link/line frame, a physical link/line frame, and a path OAMP control frame.

61. The Ethernet MAC OAMP Control Frame of claim 59, wherein the Ethernet MAC Control Opcode further comprises an ability to distinguish between an OAMP wave frame, a physical frame, a section frame, a logical link/line frame, a physical link/line frame, and a path SDH/SONET Overhead bytes frame.

62. The Ethernet MAC OAMP Control Frame of claim 59, wherein the Ethernet MAC Control Frame supports SDH/SONET Overhead Bytes transparency functionality on an Ethernet protocol network.

63. The Ethernet MAC OAMP Control Frame of claim 59, wherein the Ethernet MAC Control Opcode further comprises an ability to distinguish between an OAMP functional classification in the form of at least one of Alarm Indicator Signals (AIS), Remote Defect Indicators (RDI), Automatic Protection Switching (APS), Loopback, and Performance Monitoring (PM).

64. The Ethernet MAC OAMP Control Frame of claim 59, wherein the Ethernet MAC Control Opcode further comprises an ability to distinguish between an OAMP event in the form of at least one of AIS-L, AIS-P, RDI-L, RDI-P, APS, Internal Loopback, and Facility Loopback.

65. The Ethernet MAC OAMP Control Frame of claim 59, wherein the plurality of Ethernet MAC Control Parameters further comprises an ability to distinguish between a wave frame, a physical frame, a section frame, a logical link/line frame, a physical link/line frame, a path OAMP state, a path OAMP request, a path OAMP command, a path OAMP event, and path OAMP information.

66. The Ethernet MAC OAMP Control Frame of claim 59, wherein the Ethernet MAC Control Parameters support standard SDH/SONET Overhead Bytes values on an Ethernet protocol network.

67. A method of providing OAMP functionality on an Ethernet protocol network, comprising the steps of:

experiencing a failure along a first port/link;

generating an interrupt; and

forwarding the interrupt to an OAMP client, the OAMP client initiating a switch from the first port/link to a second port/link.

68. The method of claim 67, wherein the method executes within about 50 ms to provide recovery functionality.

69. A method of providing OAMP functionality on an Ethernet protocol network, comprising the steps of:

receiving an OAMP Control frame with OAMP information;

processing the OAMP Control frame OAMP information;

generating an interrupt; and

forwarding the interrupt to an OAMP Client, the OAMP Client processing the OAMP information received.

70. The method of claim 69, wherein the method supports SDH/SONET Overhead Bytes transparency functionality.

71. The method of claim 69, further comprising, upon receipt of an alarm event, an Alarm Indicator Signal (AIS) of a corresponding layer propagating to a downstream Network Equipment.

72. The method of claim 69, further comprising, upon receipt of an alarm event, a Remote Defect Indicator (RDI) of a corresponding layer propagating to upstream Network Equipment.

73. The method of claim 69, wherein the method executes within about 50 ms to provide recovery functionality.

74. The method of claim 69, wherein the method provides support for standard SDH/SONET OAMP functionality for at least one of linear topologies, ring topologies, and mesh topologies for Ethernet protocol networks using SDH/SONET SOH bytes, LOH bytes, and POH bytes for SDH/SONET OAMP Signaling protocol.

75. The method of claim 69, wherein the method provides support for Ethernet OAMP functionality for at least one of linear topologies, ring topologies, and mesh topologies for Ethernet protocol networks.

76. A method of providing OAMP functionality on an Ethernet protocol network, comprising of steps of:

receiving an OAMP request from an OAMP Client;

creating an OAMP Control Frame with the OAMP request; and

transmitting the OAMP Control Frame.

77. The method of claim 76, wherein the method supports SDH/SONET Overhead Bytes transparency functionality.

78. The method of claim 76, wherein the method executes within about 50 ms to provide recovery functionality.

79. The method of claim 76, wherein the method provides support for standard SDH/SONET OAMP functionality for at least one of linear topologies, ring topologies, and mesh topologies for Ethernet protocol networks using SDH/SONET SOH bytes, LOH bytes, and POH bytes for SDH/SONET OAMP Signaling protocol.

80. The method of claim 76, wherein the method provides support for Ethernet OAMP functionality for at least one of linear topologies, ring topologies, and mesh topologies for Ethernet protocol networks.

81. A method of providing OAMP functionality on an Ethernet protocol network, wherein the MAC OAMP Control sublayer provides architecture for OAMP functionality in the form of at least one of administration, configuration management, performance evaluation, technical support, and billing.

82. A method of providing OAMP functionality on an Ethernet protocol network, wherein the MAC OAMP Control sublayer supports OAMP functionality in the form of at least one of Alarms, Remote Defects, Automatic Protection Switching, Loopbacks, Performance Monitoring, Trace Signals, Sync Signals, Bit Error Rate Tests, Data Communication Channel, Orderwire, Service Level Agreements, and OAMP operations.